

### 3.5 der. of trig functions

$$\frac{d}{dx} \sin x = \cos x$$

$$\frac{d}{dx} \cos x = -\sin x$$

if  $v$  &  $a$  oppose each other (opposite signs)  
the particle slows down

if  $v$  &  $a$  have the same sign  
the particle speeds up

$$\frac{d}{dx} \tan x = \frac{d}{dx} \left( \frac{\sin x}{\cos x} \right)$$

$$\frac{\cos x \cos x - \sin x(-\sin x)}{\cos^2 x}$$

$$\frac{\cos^2 x + \sin^2 x}{\cos^2 x}$$

$$\frac{1}{\cos x} = \sec x$$

$$\frac{1}{\cos^2 x} = \sec^2 x$$

$$\frac{d}{dx} \tan x = \sec^2 x$$

$$\frac{d}{dx} \cot x = -\csc^2 x$$

$$\frac{d}{dx} \sec x = \sec x \tan x$$

$$\frac{d}{dx} \csc x = -\csc x \cot x$$

$$\frac{d}{dx} \frac{\tan x}{x} = \frac{x \sec^2 x - \tan x}{x^2}$$

$$y = \sec x \quad y' = \sec x \tan x$$

$$\begin{aligned} \text{find } y'' &= \sec x \cdot \sec^2 x + \tan x \sec x \tan x \\ &= \sec^3 x + \tan^2 x \sec x \end{aligned}$$